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Author(s): Robert Boguslaw

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SITUATION ANALYSIS AND THE PROBLEM OF ACTION

ROBERT BOGUSLAW

System Development Corporation

An anomaly, which many thoughtful persons verbalize, is the discrepancy between "book learning" and "experience." Karl Mannheim (5, p. 1), for example, was concerned with this anomaly. He sensed that the difficulty with "book learning" is simply that it is applicable only under special conditions and often is not directly transferable to the practical affairs of daily life. "Practical" men have, for better or worse, made most of the world's crucial decisions—without recourse to the latest published works. Mannheim distinguished between "pre-scientific" modes of thought used by practical men and "scientific" modes of thought used by "logicians and philosophers." He insisted, however, that even logicians and philosophers tend to use the pre-scientific, inexact mode of thought when they have to make practical decisions.

In this paper we shall examine some of the reasons for the discrepancy between the body of existing social science knowledge and social action in the significant affairs of our time. We shall then suggest efforts which can be made to reduce this discrepancy.

ESTABLISHED AND EMERGENT SITUATIONS

Let us begin by distinguishing a continuum of situations in which action can occur. We will call one pole of this continuum "established" and the other pole "emergent." An established situation is one in which all action-relevant environmental conditions are specifiable and predictable; all action-relevant states of the system are specifiable and predictable; available research technology or records

are adequate to provide statements about the probable consequences of alternative actions. An emergent situation is one in which all action-relevant environmental conditions have *not* been specified; the state of the system is *not* in accordance with relied-upon predictions; analytic solutions are *not* available, given the current state of analytic technology.

Recent efforts to construct automata which will learn to play respectable games of chess have highlighted the operational significance of our continuum. It is, of course, a trivial problem to program a high speed computer to specify the best move in a chess game for a situation in which nothing appears on the chess-board but a white king, a black king and a black rook. There are many other situations of a similar nature, characteristically occurring toward the end of a game in which a more or less simple rule, procedure, or algorithm will provide an exact specification of what each side should do under every possible set of circumstances. Indeed to train a neophyte chessplayer one of the early lessons which must be presented is the so-called "book" endings which describe the routine procedures necessary to insure a certain win under conditions of rook and king versus king, two bishops and king versus king, etc. Another essential part of the curriculum for the neophyte chessplayer is a review of the specific ways in which one can lose outright in the opening moves of the game. Techniques for avoiding or accomplishing such traps as a Fool's mate or Scholar's mate are familiar to every member of the chessplaying fraternity. It is obvious that both the opening trap and the simple end game position meet the specifications for established situations. Indeed it is obvious that the

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limiting case of an established situation is a ritual—an enactment of a drama in which every element of action has not only been predicted but specified and rehearsed.

What may be somewhat less obvious is the manner in which the work which C. Wright Mills (7) has labeled “abstracted empiricism” on the one hand and “grand theory” on the other, constitutes in fact studies of established situations. If a situation is defined to include only specified action-relevant environmental conditions and action-relevant system states, definite statements can be made about the probable consequences of alternative actions. If these statements are based upon the results of controlled experiments, the work, in Mills’ terms, is abstracted empiricism; if statements are based upon logical analysis, the work, in Mills’ terms, is grand theory. In both instances, of course, we are characteristically confronted with a correlation, between action and predicted outcome, which is usually less than 1.0. But in each case definitive probability statements can be specified and additions made to the store of social-science knowledge. If a finite number of established situations could be described which would in fact encompass all significant circumstances under which action could take place, then the role of pure social science would consist of developing appropriate predictions concerning such situations. Applied social science would then consist of making statements about the work-day world in terms of these predictions.

The fact is that, despite the incredible advances which have been made in analytical methods and the tremendous capacities of contemporary large-scale computers, the game of chess, which physically consists of thirty-two wooden pieces on sixty-four checkered squares, has not at this writing been analyzed into established

situations. This despite the fact that some of the finest computing brains and the most advanced models of our largest high speed computers have been involved in the effort to do so.

It is the so-called middle game of chess which provides an example of what we have called an “emergent” situation. Let us examine its characteristics. In contrast with various social situations that we are normally called upon to analyze, we find that the range of possibilities in middle game chess is ludicrously simple. It is possible for each side to have no more than sixteen pieces and no less than one. Each piece must be placed on one of sixty-four squares. Assume we wish to train a neophyte chess-player to deal with middle game situations on a scientific basis. We could indeed begin at random to place pieces on squares and assemble an inventory of situations. These then would have at least two features of established situations: 1) the action-relevant environmental conditions for each player in each of these situations would be specifiable and predictable; 2) all action-relevant states of the system would be specifiable and predictable. It would not, however, be the case that available research technology or records are adequate to provide statements about the probable consequences of alternative actions. If we ask what is the consequence of a given move, no definitive answer is available if a forced checkmate does not occur within a few moves. A scientific answer to the question “If I wish to win, what is the best move for me to make” is simply not available. Yet champion chessplayers continue to beat neophytes and if their secrets are not scientific, they are nonetheless effective.

It is interesting to recall that W. I. Thomas, the man who perhaps is most strongly identified with the so-called “situational” approach in sociology (16), felt distinctly uncomfortable

with the classical concept of "situation." It appears that he resolved his theoretical dilemma by introducing the notion of "subjective factors" as the prime mover of situation complication. While assuming that the situational approach did permit one to deal with all "objective" features, he recognized that there was a gaping hole in the form of what he called "subjective experience." But, of course, in a more inclusive scientific sense, what Thomas and others have referred to as subjective experience constitutes data which is more or less predictable in different situations. Thomas was really telling us that because of the inadequacy of our techniques for measuring subjective experience, more situations were in fact emergent than would otherwise be the case. His use of the personal document as a methodological aid can thus be regarded as an attempt to introduce a greater degree of predictability into situations which would otherwise have to be classified as emergent. In short, the dichotomy between subjective and objective factors is a distinction which has measurable relevance for situation analysis to the extent that it serves to alter the position of a situation along the established-emergent continuum.

This discrepancy between situations which have been analyzed through the use of either logical or empirical methods and the situations actually faced by persons in the workday world has historically given rise to some monumental protests. In this country, what Morton White (17) has described as the "Revolt Against Formalism" is an outstanding illustration. It is this discrepancy which represents the scientific rather than the philosophical or moral basis of John Dewey's attack on formal logic in his early writings; Thorstein Veblen's deprecation of the abstract-deductive methods of classical political economy; Charles A. Beard's

fight against the formal-juridical approach to the Constitution, and the famous dictum of Oliver Wendell Holmes that "the life of the law has not been logic; it has been experience" (17, p. 3).

In the area of small group research the discrepancy has raised both irrelevant and cogent critiques of experimental findings. Moreno has raised a series of questions about the typical Bales' small group study of subjects who work while being observed through one-way mirrors. Moreno suggests that while we understand what significance the situations have for observers, we are not told and do not know whether the situations have any significance for the actors (8, pp. 686-688). In this sense Moreno is raising the same kind of question raised by Thomas in his concern about the definition of the situation. If, however, one chooses to invoke (as it seems clear that Bales in fact does) a concern with group processes rather than with individual psychodynamics, then tremendous degrees of information may appropriately be postulated for the relevant definitions of the situation held by the subjects. Given this uniformity, the Bales' experimental situations may be regarded and treated as established situations for which familiar stochastic analyses can yield findings which in fact can appropriately serve as guides for action in comparable situations. To establish the fact of comparability, however, involves the problem of determining whether in the situation for action, a change in situation definition has introduced sufficiently new data into the problem to invalidate the laboratory determined predictions—in short, whether the situation has become emergent.

Indeed it seems clear that criticism of research as "not significant" is most cogent when an emergent situation is studied as if it were an established

situation. Conversely, criticism of theoretical investigations as "not true" or "intuitive" is most cogent when an established situation is studied as if it were emergent. Abortive attempts to develop elaborate speculative formulations to account for behavior in situations which can clearly be classed as established is Aristotelian arrogance at its worst. We have made and are continuing to make tremendous strides in the technology of dealing with established situations. What kind of efforts can be made to deal with emergent type situations?

IMPROVEMENTS IN ANALYTIC TECHNOLOGY

One reason for the existence of emergent situations is the sheer absence of sophisticated computer and conceptual technology to handle the enormous quantities of data needed to provide a valid study of complex recurrent situations. The effective data processing capacity of contemporary large-scale computers has definite, if not always obvious, limits. These limits are fixed in part by the sheer physical capacity of computer equipment but even more by the level of sophistication of the languages with which it is possible to communicate with this equipment. Providing the basis for more general-purpose languages through rigorous conceptual and empirical examination of the characteristics of complex social phenomena is one important effort which can be made to deal with emergent situations. It is in this sense that current work on heuristic programming (13), machine translation of languages (12), and information retrieval (9) has direct implications for dealing with the problem of action.

RECURRENT CASE HISTORY ANALYSIS

It is clearly possible to convert any historical event into an established situation if sufficient data are gathered

to explain in detail precisely how things happened. It may indeed be possible to reconstruct the event and allow it to happen again in order to test hypotheses which have been suggested as explanations. If, however, the situations thus studied are non-recurrent, then it may appear that the analyses are of interest primarily as historical commentary rather than as scientific contributions. Thus, in his critique of empiricism in sociology, Robert Bierstedt (1, p. 590) criticizes community studies which do not test or corroborate hypotheses. His argument, of course, is directed against efforts expended upon studies of non-recurrent constellations of events which are retrospectively analyzed as established situations. Here, the step which can be taken to reduce the discrepancy between social science and social action seems to be quite clear: it is to determine the incidence of established situations by testing for recurrence of significant aspects, and focusing attention upon *problems* arising in such situations. Such an effort clearly requires a much more rigorous development of case history techniques to insure the recording of data about situations which will describe both environmental parameters and system states at varying levels of specificity.

This, however, involves something more than "the accumulation of a sufficient number of case histories . . ." in order to make it "possible to abstract certain factors, patterns, complexes, behavior sequences or relationships which can presently be summarized by statistical means; and among which it may be anticipated, certain regularities and modalities will appear" (14, p. 563). Such an effort is, of course, appropriate and necessary; it will yield an increased inventory of established situations. Beyond this, however, we require illustrations of effective alternatives which in fact

were available to participants in emergent situations whether or not they acted on the basis of these alternatives. To make this even more meaningful as a learning experience, techniques must be developed which will make the probable consequences of alternative action in those situations clear to any objective observer.

BOUNDED RATIONALITY

Definitive or stochastic analyses of established situations have one common action focus: they search for the *best* solution to any given problem. A more fruitful way to view emergent situations is rationally to adopt the notion that in the real world of complex and emergent situations, this goal of finding the best solution or maximizing must characteristically be replaced by what Herbert Simon has called the goal of "satisficing," finding a course of action which is "good enough."

Simon observes that:

... the first consequence of the principle of bounded rationality is that the intended rationality of an actor requires him to construct a simplified model of the real situation in order to deal with it. He behaves rationally with respect to this model, and such behavior is not even approximately optimal with respect to the real world (15, p. 198).

This:

... is not to substitute the irrational for the rational in the explanation of human behavior but to reconstruct the theory of the rational, making of it a theory that can, with some pretense of realism, be applied to the behavior of human beings (6, p. 141).

It seems clear that psychotherapists, administrators, teachers and other practitioners have always operated with something like the concept of bounded rationality as an implicit if not an explicit construct. They do those things which are *good enough* to help the

client get well, or *good enough* to keep a firm operating in the black, or *good enough* to give students the grade of "A." The techniques used to achieve these results are characteristically described as "art" or "skill." The results, however, are frequently significantly superior to anything which classical "science" can offer in identical areas. The point to be made, of course, is that the principle of bounded rationality serves to increase the reliability of effective practitioner behavior and thus constitutes an important conceptual tool for dealing effectively with the problem of action in emergent situations.

HEURISTICS

The chessplayer, for example, is a practitioner *par excellence*. For literally thousands of years people have played chess and some players have been discernably and significantly more successful than others.

Several years ago this author and some colleagues (2) became interested in asking the question "What is the basis of their success?" We had observed that chessplayers have no dearth of rationales available to explain their success. They characteristically invoke "theories" of good play or "principles" of good play. Thus, for example, the principle of "development" is one which has become part of the folklore of the game. A chessplayer will inform you that development means to "get your pieces out" or "free your position" or something. We undertook to provide an operational definition for development by agreeing that a piece was "developed" if after it was moved there were more squares which it could legally occupy than there were prior to the move. To generalize this notion we simply agreed that White was developed with respect to Black if the total of all moves which could be made by all of White's pieces exceeded the total of

moves which could be made by Black's pieces. In short, a measure of development was devised which could be computed by simply adding the total number of legal moves available to each side at each move. We then investigated the characteristics of this development score and several other measures in an actual chess tournament (the Lessing Rosenwald Tournament held in New York during 1954-55). In this tournament, six players engaged in a double "round robin"; i.e., each person played two games with every other person, once with the White pieces and once with the Black. The tournament consisted of thirty games, twenty-five of which were "resolved"; i.e., resulted in a win for one side and five of which were "unresolved"; i.e., resulted in a draw. During the course of the tournament, a move-by-move description of each game was maintained by the use of standard chess notation. It is these detailed accounts of the thirty games which provided the basic data of our study. Analysis showed that the mean development score for winners in this tournament was greater than the mean development scores for losers and that this difference was significant at the .01 level.

These findings appeared to be sufficiently clear-cut. Development, as measured by our development score, was a significant principle to invoke if one wished to be a successful chessplayer.

However, the fact of the matter is that neither my colleagues nor myself were ever completely happy with the findings and I have some second thoughts which I should like to report at this time.

In the first place it seems clear that the operationally stated principle of development is a useful device if one wishes to train neophyte chessplayers or construct a machine which will play chess. Indeed several of the most so-

phisticated of contemporary chessplaying machines in fact use this very development score as an important part of the machine's instructions (10). It is scarcely, however, a sufficient condition for the play of championship chess. In our original study several other measures were studied, including one for piece count, occupancy of center, and legal moves to center. The latter two measures, it turned out, were *not* significantly related to success.

In any event it is clear that our efforts fell considerably short of approximating the heuristics which in fact must be invoked by successful chessplayers. A claim that within ten years the world champion chessplayer may well be a computer (11) does not deal with the fact that champion chessplayers use demonstrably more effective heuristics than they have ever been able to tell anyone about.

It does not seem necessary to revert to intuitionism to assert that the more effective of these practitioners are responding to some cues which are invisible to the rest of us. Investigations to determine the nature of the heuristics they employ to deal with these cues can provide indispensable guides for action in emergent situations, but one should perhaps not be over optimistic with respect to the ease with which all heuristics employed in effective past actions can in fact be made available for use in future situations.

SIMULATION EXERCISES

Post hoc analysis of emergent situations can, of course, frequently trace a path toward what could have been successful action. If we insist on a *priori* competence to act in emergent situations, we must inevitably proceed in the face of unexplained or unpredicted social processes. Since we can readily demonstrate the existence of differential competence on the part

of practitioners (e.g., chessplayers), an effective approach to the problem of action in emergent situations would involve a *demonstration* of such differential competence in advance, and a reliance upon the demonstrated competence for effective action in emergent situations. In short, while action may have to take place in the face of unknown social processes, it needn't take place in the face of unknown competence to deal with these processes. What is required is a measure of competence to deal effectively with emergent situations and methods for *increasing* the competence thus measured.

Role playing techniques and small group simulation exercises have long been used for training individuals or groups to behave more effectively. Although extravagant claims have from time to time been made on behalf of these techniques as instruments for increasing competence, the tests used to record progress are characteristically based upon demonstrations in situations of the kind we have called established.

Difficulties in measuring differential effectiveness in emergent situations arise in connection with the problem of ordering what might be called the "degree of emergence"; i.e., the basis on which it is possible to distinguish one emergent situation from another and to observe differential effectiveness on the part of individuals, groups, organizations or societies in dealing with these situations. To what extent can experience with previous emergent situations provide predictive clues with respect to performance in future emergent situations?

One current effort to deal with this problem has arisen from attempts to record performance differences in a simulation exercise designed to improve organizational scheduling efforts. The vehicle for this effort is STEPS (the Staff Training Exercise for Pro-

gramming Supervisors). The basic structure of STEPS has been described elsewhere (3, 4). It presents a simulated work environment for supervisory personnel engaged in a large scale computer programming effort. As a training instrument one of its goals is to increase competence in recognizing the impact upon work flow of events which can affect production. One feature of this exercise, the "Diary of Unanticipated Events," contains a list of occurrences designed to create emergent situations for participants. The problem of dealing with established versus emergent situations becomes quite specific in connection with the necessity for designing an environment which will feed back certain consequences to actions taken by participants in the exercise. One of the elements of this environment is a table which defines the amount of production to be recorded as a consequence of decisions made by the participants. This table can be summarized as a single mathematical rule, or algorithm. A hierarchy of tables can now be constructed in which the tables are differentiated from each other in terms of sheer mathematical complexity of the algorithms which define them (e.g., one table is defined by a straight line function, the next by a parabola, etc.—successive tables constituting a power series or sine series). Participants in the exercise can then be scored on their success in dealing with emergent situations by noting the degree of algorithm complexity with which they are able to cope.

This skill, of course, conceivably could be quite unrelated to actual skill in everyday action situations since these would necessarily take into account the repository of established solutions in the practitioner's repertoire.

On the other hand, however, it is clear that such a repository alone will inevitably fall short of providing the

basis for effective action in the workaday world.

Indeed it is the discrepancy between established solution repositories and the requirements for effective action which is referred to more popularly as the discrepancy between book learning and experience.

Rational reduction of the discrepancy requires explicit recognition of a lag between our understanding of action processes and the ability to act effectively. It seems clear that one promising method for dealing with this action lag lies in the direction of developing reliable measures for recording differential performance in emergent situations. Our efforts with STEPS represents one attempt to move in this direction.

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